USER MANUAL

Pro-DFM 2.0

A Worksheet Tool for DFM & Cost Analysis in the NPD Process

Pro-DFM, is a MS-Excel® based worksheet tool for Design for Manufacturability (DFM) Analysis combined with an accurate product cost estimation system. We assume that potential users are familiar with MS-Excel, therefore the Pro-DFM software requires minimal training, and can be rapidly deployed and adopted by the NPD team.

1. Key Metrics Generated

The prime objective of Pro-DFM is to provide the NPD team with an accurate estimate of the unit production cost, and then facilitate the reduction of this cost. Using Pro-DFM you will generate the following key metrics. These will be used by the NPD team to evaluate and monitor their DFM initiatives.

(i) Estimated Unit Production (EUP) Cost - The EUP Cost is what Pro-DFM estimates it will cost to make the new product. This estimate is the most accurate cost derivation. It starts with the Direct Part Cost (as provided by vendor quotes or plant estimating) and then progressively scales this cost for inventory and considers all DFM Eval factors plus any supply chain costs.

(ii) Inventory Penalty Cost - Projects the likely additional costs for maintaining the needed parts inventory. An Inventory Eval Factor (0 to 1 range) is first derived on the basis of weeks of supply and number of part variants. In the extreme case where the factor is 1, the part cost is doubled.

(iii) DFM Part Evaluation Penalty - Projects the likely additional costs in the processing of this part. A DFM Part Eval Factor (0 to 1 range) is first derived on the basis of NPD team responses to a set of scaled response queries. These queries are divided into three criteria: Procurement, Part Handling, and Part Geometry.

(iv) DFM Assembly Evaluation Penalty - Projects the likely additional costs in the execution of this assembly step. A DFM Process Eval Factor (0 to 1 range) is first derived on the basis of NPD team responses to a set of scaled response queries. These queries are divided into seven criteria: Process Difficulty, Equipment Needs, Tooling Needs, Process Setup, Handling, Inventory and Quality Control.

(v) DFM Part Reduction Opportunity – Projects the likely percent reduction is direct part costs by eliminating parts. Is based on the likelihood that individual parts can be eliminated. Where the opportunity is close to zero then the NPD team need not focus on part reduction.

2. DFM Evaluation

Pro-DFM uses a unique approach to DFM evaluation. This evaluation is based on a ***Multi Factor Scaled Response Model***. Pro-DFM analyses three different factors: inventory, parts, and assembly processes. Each of these is independently analyzed using multiple criteria, with each criterion being further divided into sub-criteria. The evaluation metrics are presented in the form of simple queries, with an anchored response scale.

Each DFM evaluation sub-criterion is evaluated on a 0 (no penalty) to 10 (maximum penalty) scale. For each sub-criterion a scale anchor is provided. You must use your judgment to select the evaluation score that best represents the specific situation. If there is insufficient information to respond then select 0.

DFM Criteria: Part Handling
DFM Sub-Criteria: Part Feed Automation

Response Scale: Part feeding into assembly machines will be
(0-2) Automatic on existing equipment
(2-5) Automatic needs new equipment
(4-8) Manual assisted feeding
(5-10) 100% Manual feeding

Each sub-criterion is weighted in the final derivation of the corresponding DFM Eval Factor. By default Pro-DFM sets the weight for each sub-criterion as 1.0, you may change this weight. If the consensus is that a specific sub-criterion is less critical to the DFM evaluation of this design, you may assign it any value in the 0 to 1 range. Note that a zero value will imply that the category has no impact on the DFM Eval Factor.

3. Assembly Process Costing

A key element in deriving the EUP Cost is the hourly cost to operate each assembly process step. For each step you have the option of either directly entering this hourly costs or deriving it using the inbuilt Pro-DFM CostCalc utility. CostCalc lets you specify the detailed labor and equipment requirements for each assembly step, including equipment setup times.

For labor details you can add up to 4 operators. For each operator you specify the Hourly Rate - operator labor cost; Productivity - relative to the production rate (80% implies only 80% output); and Busy Time - what % of time is dedicated to this step, if he operates 2 machines then 50%, if he works for 10 minutes in a 100 minute run then 10%.

For equipment details you can add up to 3 equipment. For each equipment you specify the Hourly Run Rate - cost to operate the machine minus labor; Utilization - % of run time that the machine is busy on this step, if a blender is needed for 5 minutes in a 50 minute step then 10%; and Setup Time - time to setup a batch run.

The CostCalc utility uses this data to derive the base hourly operating cost of the assembly steps. Pro-DFM then factors in batch sizes, setup times, and quality rejects rates to derive a more accurate estimate of the assembly process cost.

4. Analytical Reports

From the Pro-DFM file you will generate three reports that we feel are of most use to the NPD team. Note that all sheets in the file can be printed on an as needed basis.

NPD/DFM Executive Summary Report (Sheet #3)– This report summarizes the results of the DFM and cost analysis, and should be reviewed first by the NPD team. The report is divided into the following sections: (i) Unit Production Cost Summary, (ii) Development Time Summary, (iii) DFM Evaluation Summary, (iv) Production Cost Analytics, and (v) Design Development Time Line. The last two are graphical sections.

EUP Cost Report (Sheet #4) – This report provides summarized costing details for each part and each assembly process step. Lets you see the cost roll-up and cost significant parts and assembly process steps. Provides a starting point for direct cost reduction initiatives.

DFM Evaluation Summary Report (Sheet #6) – This report provides aggregated details of the DFM Evaluation. There are two parts to the report. The first part aggregates the part and process evaluation responses. You can see the average and maximum scores, plus alert frequency. An alert is issued when the score to any response is above your specific alert limit. The second part is divided in DFP Part Analytics and DFM Process Analytics. This presents data graphically and identifies the part and process with highest DFM scores, plus the most penalized DFM criterion.

5. Pro-DFM Software Organization

Pro-DFM is a MS-Excel® based software and requires that your computer have the XP version or later of MS-Excel installed. In a multi-user environment the software will be loaded on each computer. This will enable the NPD team to create, forward, and revise the Pro-DFM design files.

You may install Pro-DFM on a maximum number of computers as specified by you user license. Pro-DFM files can be forwarded to users who do not have ProDFM-2 installed on their computer. They will still be able to view and print the files, but not perform any actions on these files.

Pro-DFM Worksheets

FRONT:	1.	NPD/DFM Analysis Cover Page
	2.	DFM Action Item Log
REPORTS:	3.	NPD/DFM Exec Summary Report
	4.	EUP Cost Report
	5.	Analysis of Production Cost by Plant
	6.	DFM Evaluation Summary Report
DATA:	7.	Part/Material Data
	8.	DFM Part Evaluation Data
	9.	Assembly Process Data
	10.	DFM Process Evaluation Data
	11.	Assembly Process CostCalc
	12.	Supply Chain Costs
	13.	Alternate Plant
HELP:	14.	Definitions Help

The Pro-DFM software is organized into a series of worksheets. There are a total of 14 sheets which are divided into four classes. When, you open Pro-DFM you will see that the worksheets tabs are color coded by category. You can navigate between the sheets by clicking on the tabs or by selecting a sheet from the view bar in the Excel header. The data section typically contains all the raw data that you enter. The reports section presents the results of the DFM and costing analysis.

PART DATA:

- Product BOM including material specs
- Design drawings or schematics
- Part function and key features
- Test method specs
- Quality control specs
- Inventory & supply chain data

ASSEMBLY PROCESS DATA:

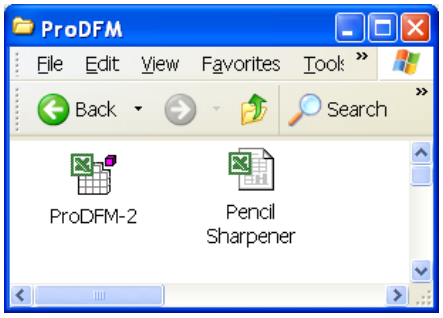
- Assembly process plan
- Tooling requirements
- Equipment requirements
- Labor and Equipment unit utilization times
- Setup times
- Quality rejection rates
- Production volumes and unit batch sizes

Listed above are the data requirements for creating a Pro-DFM file and running the analysis. You do not need wait to have all data to start the analysis. Most of the analytical components use numerical data. Where the data is not avail enter the default (usually zero) value).

For first time users we recommend that you browse through the Pro-DFM example included in the CD (Pencil Sharpener file) to familiarize yourself with the different worksheets and the associated data requirements.

6. Getting Started

The Pro-DFM CD provided to you as part of this license will have a file labeled as ProDFM-2. Note that this file is of the type MS-Excel® Add-in (.xla extension), and requires MS-Excel® XP or later to run. Create an appropriately named folder on your computer and transfer the ProDFM-2 file to this folder. Keep the CD for backup and reference purposes.



START – To start the Pro-DFM software click on the ProDFM-2 icon.

A MS-Excel window will pop-up asking you if you want enable macros. Please click on ENABLE MACROS, if you don't the program will not load. Note that you are only giving the macro permission for the Pro-DFM program and not any other programs.

If the security setting on your computer is set at HIGH it will not show the above macro permission pop-up and Pro-DFM cannot load. To change the security setting from the MS-Excel toolbar select *Tools* ► *Options*, then select the Security Tab. Click the Macro Security button, change the security level from high to medium, then click OK. Exit MS-Excel and reload Pro-DFM.

The Pro-DFM software is MS-Excel® based. The program will automatically create a Pro-DFM menu in your MS-Excel® Toolbar. You will use the functions in this menu to execute a variety of actions. The menu will automatically close when you exit MS-Excel.

USER NOTES:

1. In some cases it may be necessary to manually add-in the Pro-DFM file (happens when the macro does not load). From the *Excel Tools* menu select *Add-Ins*. Select the Pro-DFM add-in either from the list or by browsing. Then click on OK.

2. Do not click directly on the icon for a saved Pro-DFM file, since this will not activate the macro software and none of the associated functionalities will be available to you.

3. All MS-Excel functions (e.g.: Save, Print, etc.) are active at all times

4. Avoid editing data directly on the Pro-DFM worksheets, since this may not automatically update all the associated Pro-DFM equations. Use the Pro-DFM pull down menu functions to add/edit data.

5. The print settings for each worksheet have been set to print in landscape format.

6. When a new file is created the graphical components will have overlapping tags, since there is no data. They will automatically align themselves as data is added.

7. When you select any of the graphical components with a cursor action the Pro-DFM menu will temporarily disappear (this is a built in MS-Excel function).

7. Instructions by Function

Follow the instructions listed below to create your new design and conduct the DFM analysis. Note that once you have created a design file you can do the functions in any order.

FUNCTION # 1: CREATE A NEW Pro-DFM FILE

1. Start the Pro-DFM program. A welcome menu will appear.

2. Click on **Create a New Pro-DFM File**

3. From the Save As window select where you want to save the file

4. Enter the File Name and then click Save

5. The Create New Design File Window will appear

6. Enter the needed data and click the **Create New File** button. You can leave some fields blank but the Product Name field is required

7. You have now successfully created a new design file. The new file will automatically open on sheet #1.

FUNCTION # 2: OPEN AN EXISTING Pro-DFM FILE

1. Start the Pro-DFM program. If Pro-DFM is already open, then from the Pro-DFM menu select *Create/Open a Pro-DFM File*. Note that you can have multiple pro-DFM files open at the same time.

2. A welcome menu will appear. Click on **Open an Existing Pro-DFM File**

3. From the Open window select the file you want to open and click Open

4. The selected file will be loaded and opened. Note that the file will open on the sheet from which you last saved the file.

FUNCTION # 3: ADD/EDIT A PART

1. From the Pro-DFM menu select *Part Actions* ► *Add New Part*
2. The Add Parts window will appear. Enter the required data and then click **Add Part**. Click on the Help link for a list of definitions associated with this window.
3. A preview of your entered data will be shown, click on **OK** to accept or **Change** to edit the data. The part data will now be added in different worksheets of the Pro-DFM file.
4. Repeat to add other new parts.
5. When done click on **Done Adding Parts**. Note that you can always add parts later.
6. To edit the data for a Part, from the Pro-DFM menu select *Part Action* ► *Edit Part Data*.
7. The Edit Part window will appear. Select the part to be edited. Make the changes and then click on **Update Part Data**.

FUNCTION # 4: DFM PART EVALUATION

1. From the Pro-DFM menu select *Part Actions* ► *DFM Part Evaluation*
2. The DFM Part Evaluation window will appear. Select the part you want to evaluate. If you are editing data the current data will be displayed and you can change it.
3. Enter all the known part details. Click on the Help link if needed.
4. Evaluate the part for each listed sub-criterion on a scale of 0-10. Click on View Scale for help with the response scale. When in doubt always enter the lower response score.
5. When done click on **Submit Evaluation**
6. Select and repeat with other parts
7. When done click on **Done Evaluating Parts**

FUNCTION # 5: DELETE A PART

1. From the Pro-DFM menu select *Part Actions* ► *Delete Parts*
2. The Delete Parts window will appear. Select the part you want to delete. **Click on Delete Part**. All data associated with this part will be removed from several worksheets. Note that this action is permanent.
3. If there is only part and this is deleted, the current Pro-DFM file cannot be reused. Since there will be zero parts left we suggest you create a new file. Alternatively, add the next part and then delete the part.

FUNCTION # 6: ADD/EDIT AN ASSEMBLY PROCESS

1. From the Pro-DFM menu select *Process Actions* ► *Add New Process*
2. The Add Assembly Process window will appear. Enter all the required data. Click on the Help link for a list of definitions associated with this window.
3. Pro-DFM provides you with two options to enter the Process Cost/Hour. If you already know the costs enter it directly. Else to use the Pro-DFM CostCalc utility select Use CostCalc and then click on **Recalculate**.
4. Using the CostCalc Utility. Enter the data for each Operator and Equipment. If there are only 2 operators you need to enter data in only the first 2 columns. When done click on **Calculate**. The CostCalc summary section will be updated. Review and then click on **Update Process Sheet**. The Process Cost/Hr and the Setup Time fields will be automatically updated on the Add Assembly Process window.
5. Click on **Add Process**. The process data will now be added in different worksheets of the design file.
6. Click on **Next Process** and repeat to add other assembly processes
7. When done click on **Done Adding Processes**
8. To Edit the data for an Assembly Process from the Pro-DFM menu select *Process Action* ► *Edit Process Data*
9. The Edit Assembly Process window will appear. Select the process to be edited. Make the changes and then click on **Update Part Data**.
10. There are some restrictions during editing. For a process where the cost data was entered through CostCalc, you must review the CostCalc data again (even if no changes are needed). For a process where the cost was entered directly you can switch to the CostCalc utility, but the reverse is not allowable.

FUNCTION # 7: DFM PROCESS EVALUATION

1. From the Pro-DFM menu select *Process Actions* ► *DFM Process Evaluation*
2. The DFM Assembly Process Evaluation window will appear. Select the assembly process you want to evaluate. If you are editing data the current data will be displayed and you can change it.
3. Evaluate the process for each listed sub-criteria on a scale of 0-10. Click on View Scale for help with the response scale. When in doubt always enter the lower response score.
4. When done click on **Submit Evaluation**
5. Select and repeat with other processes
6. When done click on **Done Evaluating Parts**
7. For each process step directly enter the Parts Assembled Data on the worksheet

FUNCTION # 8: DELETE A PROCESS

1. From the Pro-DFM menu select *Process Actions* ► *Delete Process*
2. The Delete Process window will appear. Select the process you want to delete. **Click on Delete Process**. All data associated with this process will be removed from several worksheets. Note that this action is permanent.
3. If there is only process and this is deleted, the current Pro-DFM file cannot be reused. Since there will be zero processes left causing a fatal error. We suggest you first add the next process and then delete the process.

FUNCTION # 9: ADD/EDIT SUPPLY CHAIN COSTS

1. From the Pro-DFM menu select *Advanced Functions* ► *Supply Chain Costs*
2. The Supply Chain Cost window will appear. Select the plant for which you want to add/edit the data. Enter the Inbound and Outbound supply chain costs.
3. Note the window will list 10 parts at a time. If there are more than 10 parts click **Next Set of Parts** to add/edit the data.
4. When done click on **Update Supply Chain Costs**, then on **Update All Supply Costs**.

FUNCTION # 10: ADD ALTERNATE PLANT DATA

1. From the Pro-DFM menu select *Advanced Functions* ► *Cost Analysis by Plant*
2. The Cost Analysis by Plant window will appear. Enter the location or name of the New Plant that you want to compare with the planned default plant.
3. Enter the relative factor data for the new plant
4. When done click on **Add New Plant Data**.
5. To view the cost analyses by plant report go to sheet #5 in the design file.

FUNCTION # 11: UPDATE DFM EVALUATION SUMMARY

1. From the Pro-DFM menu select *Advanced Functions* ► *Update DFM Eval Summary*
2. No window will appear. The Pro-DFM program will review the DFM Evaluation data and make changes to the DFM Evaluation Summary Report (sheet #6). Specifically, the alert count will be updated.

FUNCTION # 12: ADD OR UPDATE DFM ACTION ITEM

1. From the Pro-DFM file navigate to sheet #2.
2. Enter the new action item (or update an existing items) directly on this sheet.

FUNCTION # 13: CHANGE INDIRECT RATES

1. Pro-DFM uses two indirect cost rates: product and process. By default these are set at 10% and 25%. To change the values click on the tab for sheet # 4 (EUP Cost Report)
2. To change the indirect product rate. Go to cell L6 and enter the new rate.
3. To change the indirect process rate. Go to cell L8 and enter the new rate.

FUNCTION # 14: CHANGE SUB-CRITERION WEIGHTS

1. Each DFM sub-criterion is a weight in the 0 (no penalty) to 10 (maximum penalty) scale. By default these are set at 1.0. To change the weights click on the tab for sheet # 7 (for Parts) or sheet # 10 (for Processes)
2. To change the weights. Go to row 5 and the column corresponding to a specific sub-criterion and enter the new weight.

After completing all the above steps you can review, analyze and print the reports section of Pro-DFM.

You can check the definitions for any specific parameter or attribute by clicking on the Pro-DFM menu, then select *Definitions Help.* For any questions or problems please email us at *helpdesk@cloversoft.net*

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